BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

As rescanning documents *will not* correct images, please do not report the images to the Image Problem Mailbox.

BA

(19) **European Patent Office**

(11) Publication number: **0 639,389 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **94890134.3**

(22) Date of filing: **August 12, 1994**

(51) Int. Cl. [6]: **A61M 39/26**

(30) Priority: **August 17, 1993 AT 1642/93**

(43) Date of publication of the application: **February 22, 1995 Patentblatt [Patent Bulletin] 95/08**

(84) Designated contracting states: **AT CH DE FR GB IT LI SE**

(71) Applicant: **Dieringer, Franz A.**
Mannlichergasse 8
A-2371 Hinterbrühl (AT)

(72) Inventor: **Dieringer, Franz A.**
Mannlichergasse 8
A-2371 Hinterbrühl (AT)

(74) Representative: **Haffner, Thomas, M., Dr.**
Patent Attorney Office
Dipl.-Eng. Adolf Kretschmer
Dr. Thomas M. Haffner
Schottengasse 3a
A-1014 Vienna (AT)

(54) **A coupling for the connection of flexible tubing.**

(57) In a coupling for the connection of flexible tubing for medical purposes containing a first coupling part (1), in which is mounted a hollow mandrel (3) that has passage openings (4, 5) and is for joining a first piece of tubing, this mandrel opening into a second coupling part (15) that is reversibly connected to the first coupling part (1), whereby the second coupling part (15) has at least two connecting openings (17, 18) and a shiftable closing piece, the connecting openings (17, 18) of the second coupling piece (15) are staggered in the axial direction, whereby the closing piece (19) has at least one recess or perforation that, in a first shifted position of the closing piece (19), connects the two connecting openings (17, 18) of the second coupling part (15) and, in a second shifted position, separates them from each other, whereby one connecting opening (18) of the second coupling part (15), in the second shifted position of the closing piece (19), is in open connection with the hollow mandrel (3) of the first coupling part (1).

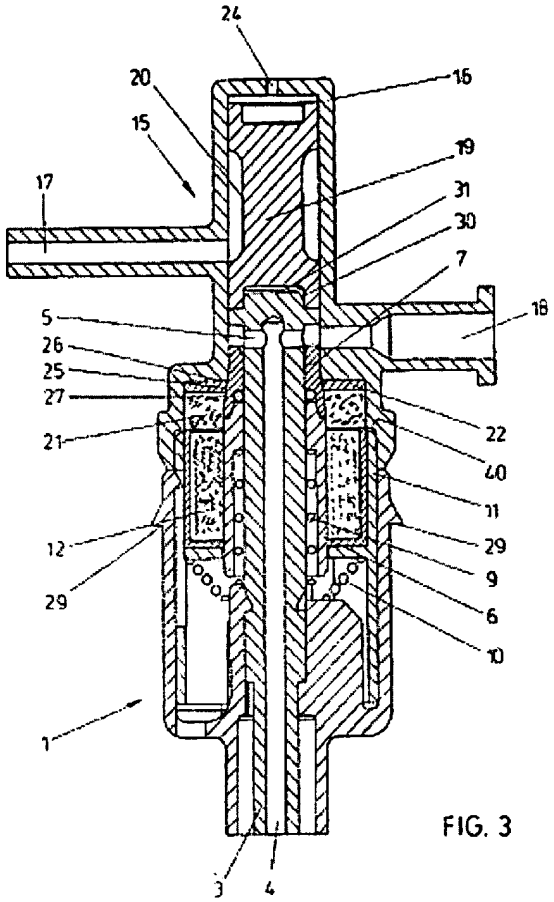


FIG. 3

The invention concerns a coupling for the connection of flexible tubing for medical purposes containing a first coupling part in which is mounted a hollow mandrel that has passage openings and is for joining a first piece of tubing, this mandrel opening into a second coupling part that is reversibly connected to the first coupling part, whereby the second coupling part has at least two connecting openings and a shiftable closing piece.

A coupling of the kind named initially is already to be understood from, for example, AT Patent 394,657. A further device of a similar kind has become known from WO A1 90/07953. In the known sterile connections for flexible tubing for medical purposes, a hollow mandrel is held in a coupling part in an axially shiftable manner in each case. The free end opposite the tube connection of the mandrel moves through elastically deformable inserts, which can be impregnated with a disinfectant, when the mandrel is shifted axially. The shifting occurs until the orifice of the axially shiftable mandrel inserts into a second coupling part, whereby this second coupling part, which can be connected to the first coupling part, has at least two openings. In the final position of the mandrel, one of the two openings is closed by shifting it, whereby, through the second opening of the second coupling part, it is possible to connect infusion bottles, bags, or the like directly to the patient. In order to exchange infusion bottles or the like of this kind, the axially shiftable mandrel has to be retracted once again, after which, following the exchange of the infusion bottles, bags, or the like, the hollow mandrel could be moved once again into its shifted position, in which an open connection prevails once again between the infusion bottle and the hollow mandrel. A drawback in the known designs was that, during each shifting of the mandrel, a variable volume of fluid was hereby squeezed out of the coupling part. Moreover, the handling of the coupling was relatively complicated, because, owing to the requisite tightness, it was necessary to fabricate it with very narrow tolerances, this resulting in relatively high shifting forces.

The object of the invention is to create a coupling of the kind named initially, in which the effort of manipulation is substantially reduced and which makes possible a secure manipulation and, in particular, a secure exchange of infusion instruments with little effort. At the same time, the object of the invention is to form the coupling in such a way that, during a switch of connecting openings in the second coupling piece, it is not necessary to displace any fluid volumes and thus clean and sterile work is ensured in each phase. In order to solve this problem, the coupling in accordance with the invention consists essentially in the fact that the connecting openings of the second coupling piece are staggered in the axial direction and that the the closing piece has at least one recess or perforation that, in a first shifted position of the closing piece, connects the two connecting openings of the second coupling part and, in a second shifted position, separates them from each other, whereby one connecting opening of the second coupling part, in the second shifted position of the closing piece, is in open connection with the hollow mandrel of the first coupling part. The fact that the connecting openings of the second coupling piece are staggered in the axial direction and that the closing piece has at least one recess or perforation, which, in a first shifted position of the closing piece, connects the two connecting openings of the second coupling part and, in a second shifted position, separates them from each other, makes possible a shifting of the closing piece for which it is not necessary to displace any fluid volumes and for which, in a first shifted position, the two connecting openings are in aligned connection with each other, whereas, in a second shifted position, the connecting openings of the second coupling piece are securely separated from each other. In this second shifted position, it is then possible to place one connecting opening in open connection with the hollow mandrel. The design in accordance with the invention is substantially simplified in its manipulation and, owing to the avoidance of fluid volumes being squeezed out during shifting of the closing piece, work with the coupling in accordance with the invention is substantially facilitated. In order to be able to dispense with an axial shift of the mandrel and thus with a high effort of manipulation, it is advantageous to make the construction in such a way that, joined

axially to the mandrel in a movable manner is at least one valve sleeve or one valve needle, the face or seat of which, respectively, is spring-pressed against an annular rim or a valve seat of the mandrel, whereby, during coupling with the second coupling part, the valve sleeve can be pressed in a sealing manner against a bearing surface of the second coupling part and is held in this position and whereby the valve sleeve or the valve needle can move in the axial direction with release of the passage openings of the mandrel. The axially shiftable valve sleeve or the valve needle is hereby pushed back when the second coupling piece is fixed in place and releases the passage openings of the mandrel, whereby, for this path of movement of the valve sleeve, it is possible, at the same time, to ensure the requisite sterility of the connection and a precise sealing can ensue. Achieved overall is a construction in which a secure and sterile connection is made possible, in any rotated position whatsoever of the coupling piece.

It is advantageous to make the construction here in such a way that the diameter of the annular rim corresponds essentially to the inner diameter of an axial bore of the second coupling part, into which bore the two connecting openings open in axial direction in a staggered manner. In this way, the annular rim of the mandrel inserts into the bore of the second coupling part, sealing it as much as possible, so that the desired sterility and an especially simple operation are ensured here as well.

The closing piece itself can have either bores or, externally, a circumferential groove for connection of the two connecting openings of the second coupling piece. According to an especially preferred construction, the closing piece is formed as a plunger that can move in the bore of the second coupling part so that it seals this part, whereby, preferably, the recess of the closing piece is formed as a circumferential groove, the width of which, in the axial direction, is greater than or equal to the separation of the connecting openings of the second coupling piece from each other. In this way, when the closing piece is shifted, only the fluid volume contained in the ring groove is displaced, without fluids being thereby squeezed out, and an especially simple and operationally secure design is ensured.

It is especially advantageous to make the construction in such a way that the side of the plunger facing the mandrel bears a centering opening for a part of the mandrel that projects beyond the annular rim of the mandrel. During the shifting, a centering of this kind makes it possible to reduce further the effort required for arranging the second coupling part and for shifting the closing member, whereby it is advantageous to make the construction in such a way that the valve sleeve is formed from two parts that adjoin each other axially and whose part that is brought to rest against the annular rim has an outer surface that forms a conical seal. In this way, a tight connection is ensured by the valve sleeve or by a part of this valve sleeve that is spring-pressed against the second coupling part, for which it is advantageous to make the construction in such a way that the second coupling part can be joined to the first coupling part under compression of a spring that supports the valve sleeve.

The design in accordance with the invention makes it possible to dispense with an axial shift of the mandrel relative to the first coupling part, whereby, as already mentioned in the beginning, the handling is substantially simplified. Here, it is advantageous to make the construction in such a way that the mandrel is connected in the axial direction with the first coupling part in a non-movable manner.

In order to achieve the requisite sterility of the connection, it is possible to use, as in the case of known designs, sponges soaked with disinfectant, whereby it is advantageous to make the construction in such a way that a sponge containing disinfectant is mounted in the first coupling part in a shiftable manner in a basket or the like that can be shifted axially against the force of another spring and, preferably, a ring-shaped sponge that is soaked with disinfectant is arranged at the front of the second coupling part that faces the first coupling part. A construction of this kind leads to the fact that, when the second coupling piece is exchanged, new disinfectant is automatically introduced and the sponge of the first coupling piece is soaked once again with disinfectant, so that the sterility of the connection is maintained.

The invention will now be illustrated in greater detail on the basis of an embodiment example depicted schematically in a drawing. In it, Fig. 1 shows a section through a first coupling part of the coupling in accordance with the invention; Fig. 2 shows a section through a second coupling part of the coupling in accordance with the invention; Fig. 3 shows a section through the coupling in accordance with the invention, whereby the coupling parts of Fig. 1 and Fig. 2 in an assembled state are depicted; Fig. 4 shows a sectional depiction in perspective of the coupling in accordance with the invention in assembled state; and Fig. 5 shows a modified construction in a depiction corresponding to Fig. 3.

The first coupling part 1 depicted in Fig. 1 has a hollow mandrel 3 that is joined rigidly to the housing 2 of the first coupling part 1 and to which a piece of flexible tubing, which is not depicted in greater detail and which is connected to the patient, can be fixed. The hollow mandrel 3 has a passage channel 4, which opens into passage openings 5, which, in the state in which the coupling part 1 is linked together with a second coupling part 15, are aligned with connecting openings of this second coupling part. Arranged in a movable manner on the outer circumference of the hollow mandrel 3 is a valve sleeve, which is formed from two parts 6 and 7, which adjoin each other axially. In the closed state of the first coupling part 1 depicted in Fig. 1, the valve part 7 is slid over the passage openings 5 of the hollow mandrel 3 and seals these. The valve part 7 is supported here on an annular rim 8 of the hollow mandrel 3 and is held in this position by a pressure spring 9. Here, the valve part 6 carries the pressure spring 9.

A pressure spring 10 impinges on a basket 11 that can shift within the housing 2 of the first coupling part 1 and in which is arranged a sponge 12 that is soaked with disinfectant and surrounds the valve part 7. In the closed state of the first coupling part 1 depicted in Fig. 1, this part is sealed in a sterile manner by another sponge 13 and a cap 14. A sealing ring 27 seals the valve sleeve against the hollow mandrel 3.

The second coupling part 15 depicted in Fig. 2 has a housing 16 on which are staggered connecting openings 17 and 18 in the axial direction of this second coupling part 15. The second

coupling part 15 bears, as a closing piece 19, a plunger that can move so s to seal this part, whereby the plunger 19 has, on its outer circumference, a recess or a circumferential groove 20, which, in the non-operated state of the second coupling part 15 depicted in Fig. 2, releases the connection between the connecting openings 17 and 18. In this state, the second coupling part 15 can be ventilated or a fluid can be sucked in through the needle bore or ventilation opening 17. Arranged in the second coupling part 15 is also a sponge 21 that is soaked with disinfectant as well as a wiping lip 22, whereby these elements have a ring-shaped construction corresponding to the outer diameter of the hollow mandrel that is inserted in the coupled state. The second coupling part 15 is also sealed in a sterile manner by a cap 23 prior to its use.

In the coupled state of the two coupling parts 1 and 15 depicted in Fig. 3, it is evident that the passage openings 5 of the hollow mandrel 3 open directly into the injection or infusion opening 18 of the second coupling part 15. The coupling of the two coupling parts 1 and 15 results in movement of the closing piece 19 into a position in which a connection is no longer released between the connecting openings 17 and 18 of the second coupling part 15 via the circumferential groove 20 of the plunger 19. Provided for the shifting movement of the plunger 19 is a relief bore 24 on the face of the second coupling part 15. For the centering of the mandrel 3 during the coupling, the mandrel has a separate region 30 on its face, which can fit into a corresponding recess 31 on the plunger 19.

The passage openings 5, which are closed by the valve part 7 in the unused state, are released during the coupling of the coupling parts by one bearing surface 25 of the valve part 7 coming to rest on a shoulder 26 of the second coupling part 15, whereby, when the first coupling part 1 is inserted further into the second coupling part 15, a shifting of the two-part valve sleeve 6, 7 occurs. Prior to this, the basket 11 is already pressed against a surface 40 and pushed back against the force of the spring 10. For a complete sealing, a sealing ring 27 is provided between the valve parts 6 and 7 and the hollow mandrel 3.

By the use of a plunger 19 constructed with a circumferential groove as a closing piece, the fluid volume contained in the recess 20 is entrained during the shifting of the plunger when the coupling is linked together and no fluid leaks out of the needle bore 17. In place of the circumferential groove 20, it is also possible to provide a perforating hole in the plunger 19, the ends of which must be matched to the axial separation of the connecting openings 17 and 18 of the second coupling piece 15, whereby the plunger 19 must be secured in place against rotation.

In order to release the connection, depicted in Fig. 3, between a patient and a syringe or infusion connected to the connecting opening 18, the connection is released by operation of locking hooks 28 that are constructed on the second coupling part 15 and that are depicted in detail in Fig. 4 and act together with the catch collar 29 on the outer circumference of the first coupling part. When the second coupling part 15 is removed, the valve parts 6 and 7 are shifted axially on the outer circumference of the hollow mandrel 3 by impingement due to the force of the springs 9 and 10, whereby the passage openings 5 are closed. By means of a similar axial shift of the basket 11 and of the sponge 12 contained therein, the head of the hollow mandrel 3 as well as the valve parts 6 and 7 are situated once again in a disinfecting environment. The second coupling part 15 can thus be taken off and, as a single-use part, it can be disposed of, after which either another second coupling part is connected with the first coupling part or else the first coupling part is closed once again in a sterile manner by use of a new cap 14 containing a sponge 13.

In the perspective drawing in accordance with Fig. 4, the key components of the two coupling parts 1 and 15 are depicted in their position immediately prior to being coupled. For reasons of clarity, the springs and sponge elements, for example, are not drawn.

In the modified embodiment in accordance with Fig. 5, a valve needle 42 with conical seat faces is used in place of the valve sleeves 6, 7. The opening of the valve by lifting from the seat faces 43 of the valve is effected by a projection 41 of the closing member 19. The other

components, which are labeled, as before, with the same reference numbers, correspond in function to the corresponding parts in the depiction in accordance with Fig. 3.

Patent Claims

1. A coupling for the connection of flexible tubing for medical purposes containing a first coupling part (1), in which is mounted a hollow mandrel (3) that has passage openings (5) and is for joining a first piece of tubing, this mandrel (3) opening into a second coupling part (15) that is reversibly connected to the first coupling part (1), whereby the second coupling part (15) has at least two connecting openings (17, 18) and a shiftable closing piece (19), characterized in that the connecting openings (17, 18) of the second coupling piece (15) are staggered in the axial direction and in that the closing piece (19) has at least one recess or perforation (20) that, in a first shifted position of the closing piece (19), connects the two connecting openings (17, 18) of the second coupling part (15) and, in a second shifted position, separates them from each other, whereby one connecting opening of the second coupling part (15), in the second shifted position of the closing piece (19), is in open connection with the hollow mandrel (3) of the first coupling part (1).

2. The coupling according to claim 1, further characterized in that at least one valve sleeve (6, 7) or one valve needle (42) is joined in an axially movable manner to the mandrel (3), the face or seat of which is spring-pressed against an annular rim (8) or a valve seat (43) of the mandrel (3), whereby, during coupling with the second coupling part (15), the valve sleeve (6, 7) can be pressed so that it seals against a bearing surface (25) of the second coupling part (15) and is held in this position and whereby the valve sleeve

(6, 7) or the valve needle (42) can move in the axial direction with release of the passage openings (5) of the mandrel (3).

3. The coupling according to claim 2, further characterized in that the diameter of the annular rim (8) corresponds essentially to the inner diameter of an axial bore of the second coupling part (15), into which bore the two connecting openings (17, 18) open in axial direction in a staggered manner.

4. The coupling according to claims 1, 2, and 3, further characterized in that the closing piece (19) is formed as a plunger that can move in the bore of the second coupling part (15) in a sealing manner.

5. The coupling according to one of claims 1 to 4, further characterized in that the recess (20) of the closing piece (19) is formed as a circumferential groove, the width of which, in the axial direction, is greater than or equal to the separation of the connecting openings (17, 18) of the second coupling piece (15) from each other.

6. The coupling according to one of claims 1 to 5, further characterized in that the side of the plunger (19) facing the mandrel (3) bears a centering opening for a part of the mandrel (3) that projects beyond the annular rim (8) of the mandrel (3).

7. The coupling according to one of claims 2 to 6, further characterized in that the valve sleeve (6, 7) is formed from two parts that adjoin each other axially and whose part that is brought to rest against the annular rim (8) has an outer face that forms a conical seal, wherein, a sealing ring (27) is contained between the axially adjoining parts.

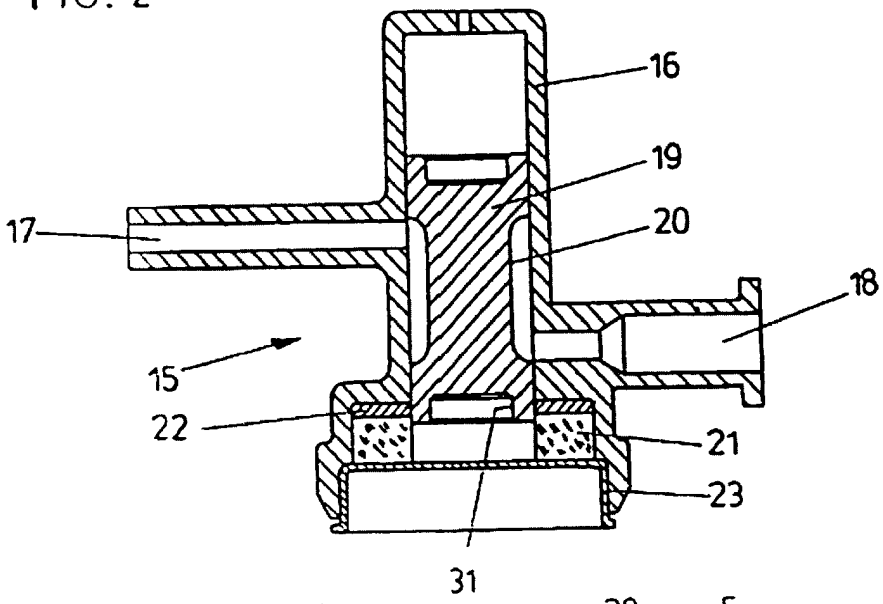
8. The coupling according to one of claims 2 to 7, further characterized in that the second coupling part (15) can be connected with the first coupling part (1) under compression of a spring (9) that supports the valve sleeve (6, 7).

9. The coupling according to one of claims 1 to 8, further characterized in that the mandrel (3) is connected in the axial direction with the first coupling part (1) in a non-movable manner.

10. The coupling according to one of claims 1 to 9, further characterized in that a sponge (12) containing disinfectant is arranged in the first coupling part (1) in a shiftable manner in a basket (11) or the like that can be shifted axially against the force of another spring (10).

11. The coupling according to one of claims 1 to 10, further characterized in that a ring-shaped sponge (21) that is soaked with disinfectant is arranged at the front of the second coupling part (15) that faces the first coupling part (1).

FIG. 2



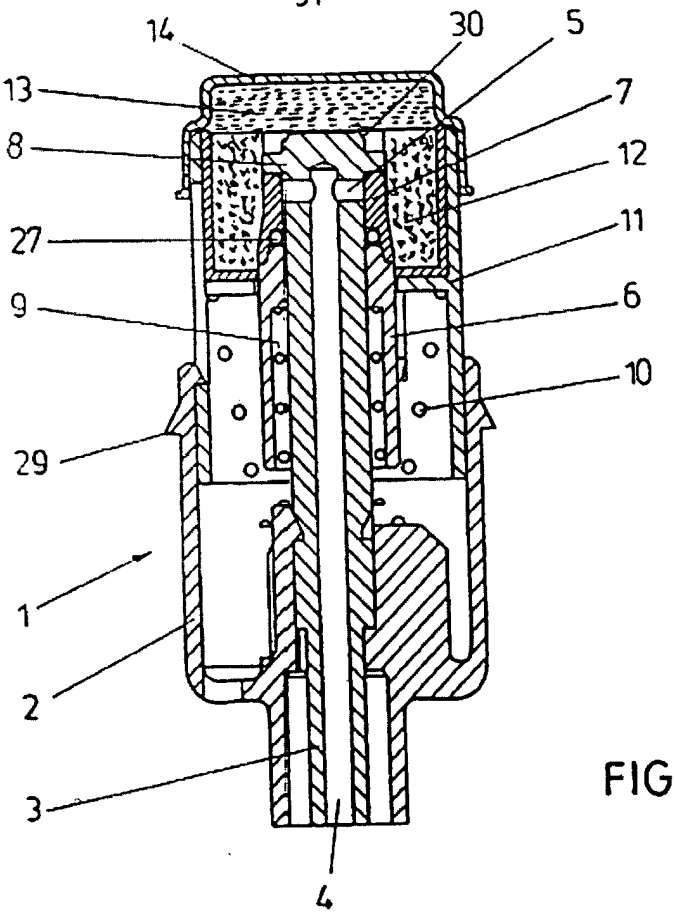


FIG. 1

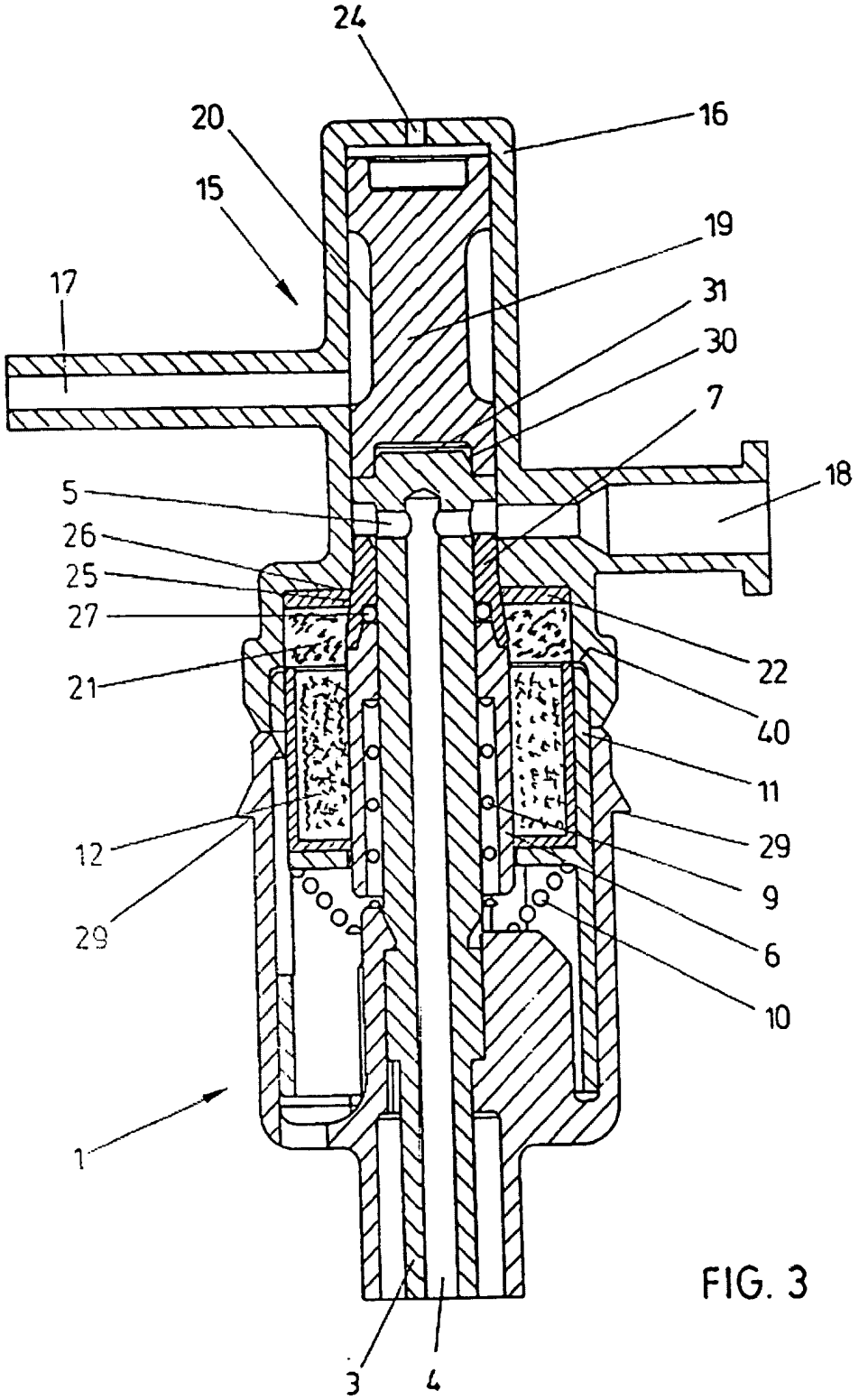
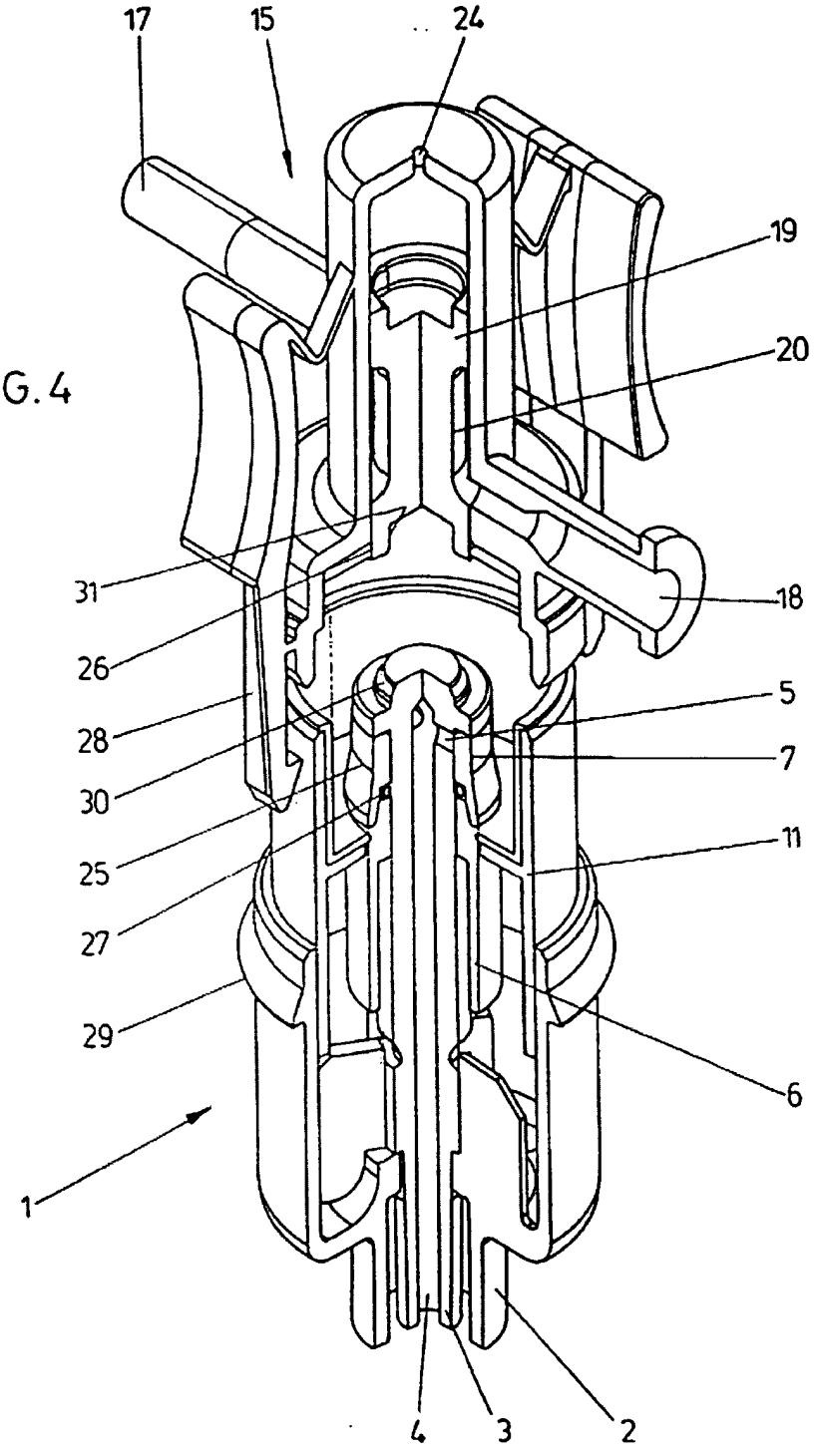


FIG. 3

FIG. 4



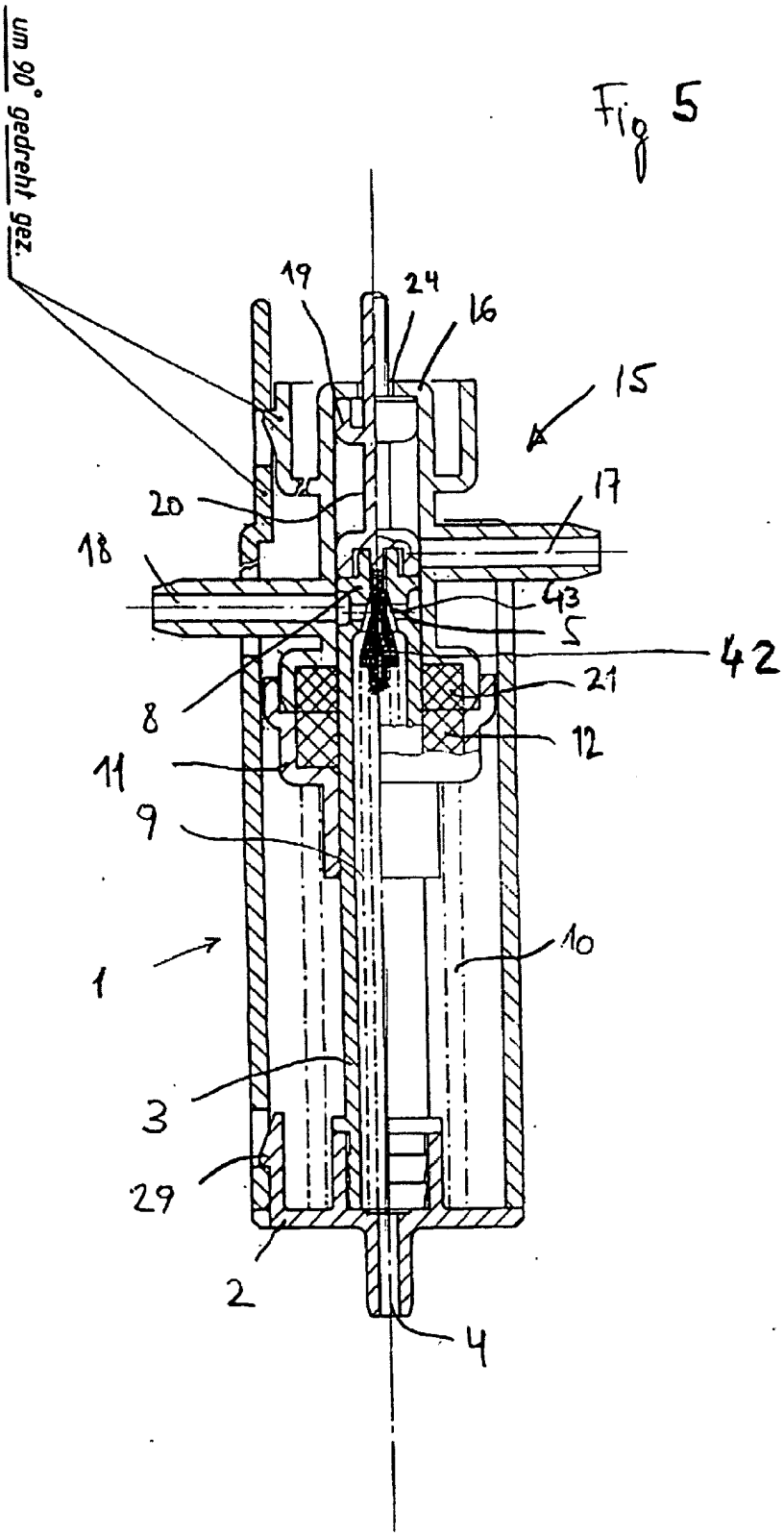


Fig 5

Drawn rotated by 90°

EP 0 639 389 A1

European Patent Office

EUROPEAN SEARCH REPORT

Number of the Application: EP 94 89 0134

RELEVANT DOCUMENTS

Category	Citation of the document with indication, where appropriate, of the relevant passages	Relevant to Claim No.	CLASSIFICATION OF THE APPLICATION (Int. Cl. 6)
X	US A 4,534,758 (AKERS ET AL.) * column 7, line 22 - line 58 * * figures 9, 10 *	1	A 61M39/26
A		4, 5	

A, D	AT B 394,657 (DIERINGER) * page 3, line 51 - page 5, line 2 * * figures 1, 2 *	1, 6, 10, 11	

A	EP A 0 087,901 (AVON INDUSTRIAL POLYMERS LIMITED) * page 5, line 22 - page 6, line 23 * * figure 1 *	2, 8, 9	

A	US A 5,228,646 (RAINES) * column 2, line 43 - line 46 * * figure 1 *	5	

			SUBJECT AREA SEARCHED (Int. Cl. 6)
			A61M F16L

The present search report was prepared for all patent claims

Search Office	Conclusion Date of the Search	Examiner
THE HAGUE	Nov. 15, 1994	Schönleben, J.

CATEGORY OF THE CITED DOCUMENT

X : Document of particular relevance taken alone
Y : Document of particular relevance combined with another publication of the same category
A : Technical background
O : Nonwritten disclosure
P : Intervening literature

T : Theory or principles upon which the invention is based
E : Earlier patent document, but published on or after the filing date
D : Document presented in the application
L : Document presented for other reasons

.....

& : Member of the same patent family, corresponding document